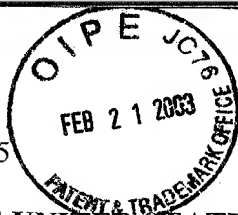


Docket No.: 57357-015



PATENT 2800

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Boris MASLOV, et al.

Serial No.: 09/826,422

Filed: April 05, 2001

Group Art Unit: 2834

Examiner: H.N. Nguyen

For: ROTARY ELECTRIC MOTOR HAVING CONCENTRIC ANNULAR MEMBERS

TRANSMITTAL OF APPEAL BRIEF

Commissioner for Patents
Washington, DC 20231

Sir:

Submitted herewith in triplicate is Appellant(s) Appeal Brief in support of the Notice of Appeal filed January 8, 2003. Please charge the Appeal Brief fee of \$160.00 to Deposit Account 500417.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

02/24/2003 JBALINAM 00000025 09826422

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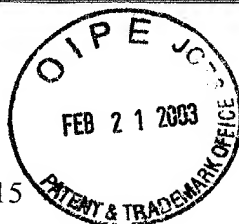


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Docket No.: 57357-015

PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
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In re Application of

Boris MASLOV, et al.

Serial No.: 09/826,422

Filed: April 05, 2001

For: ROTARY ELECTRIC MOTOR HAVING CONCENTRIC ANNULAR MEMBERS

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Group Art Unit: 2834

Examiner: H.N. Nguyen

APPEAL BRIEF

Commissioner for Patents
Washington, DC 20231

Sir:

This Brief is submitted pursuant to the appeal of the final rejection of claims 1 through 6 and 11 through 16, filed January 8, 2003.

I. Real Party In Interest

The real party in interest in this application is Wavecrest Laboratories, Inc.

II. Related Appeals And Interferences

No other appeals or interferences are believed to affect or be affected by a decision in this appeal.

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III. Status Of Claims

Claims 1 through 6 and 11 through 16 stand under final rejection. No claims have been allowed.

IV. Status Of Amendments

No Amendment has been filed under 37 CFR 1.116 after the final Office Action (hereinafter "the Office Action") of October 8, 2002.

V. Summary Of Invention

The present invention relates to a rotary direct current electric motor in which rotor and stator members are each configured as annular rings, concentric with respect to each other, about an axis of rotation. In the illustration of Fig. 1, the rotor comprises a plurality of permanent magnets 12 substantially equidistantly distributed with alternating magnetic polarity along the angular circumferential extent of the radial air gap formed between the stator and rotor, the permanent magnets having a common magnetic return path 14. Within the cylindrical rotor structure, the stator is formed of groups of electromagnet pole pairs 22, the groups substantially equidistantly distributed along the angular extent of the annular ring. As shown in Figs. 2 and 3, the stator groups are rigidly secured by two plates 32 of non-magnetically permeable material. Thus, each of the electromagnet groups comprises magnetic material 24 magnetically isolated and separated from the other groups. As each stator group is individually secured in the stator annular ring structure, removal and replacement of an individual stator group is facilitated. Thus, if a particular stator winding group should become damaged, the individual stator group can be replaced without

removing or replacing the entire stator unit. With the use of a large number of single pole pair stator groups, the motor can continue to operate in a satisfactory manner even if one or more particular electromagnet pole group energization fails.

Two poles are provided for each electromagnet group. The poles of each pole pair are wound in opposite directions with windings 28, to provide opposite north/south polarities when the windings are energized. As described at page 5 of the specification, switched energization of only a single pole pair, wherein current in the windings is reversed, aids change of magnetic polarities of the poles without deleterious flux effects for the particular electromagnet group. Magnetic path isolation of the individual pole pair from other pole groups eliminates a flux transformer effect on an adjacent group when the energization of the pole pair windings is switched. The lack of additional poles in an electromagnet group precludes any such effects within the group.

Implementation of a switching scheme is dependent upon relative position between rotor and stator elements. Switching may be performed in response to signals generated by a position sensor. By appropriately timing the switched winding energization for each of the electromagnet groups, development of smooth electromotive force throughout the motor is attained. The precise optimum phase and sequence for timed switching of particular groups is dependent upon the particular structural configuration of electromagnetic poles, permanent magnet poles, spacing among various poles and other structural interrelationships. An odd number of stator groups is utilized. The stator poles have pole faces at the air gap that are of substantially uniform angular extent. The rotor permanent magnets are of substantially equal angular dimensional extent at the air gap, which is different from the stator pole face dimension. The angular distance between the

centers of the pole faces of each stator group is substantially uniform throughout the periphery of the stator and differs from the angular distance between the centers of the stator pole faces of adjacent groups. Gaps between adjacent stator pole faces within each group are substantially equal for all groups and different from gaps between adjacent stator groups.

The rotor pole faces are separated substantially uniformly by gaps, the gaps between adjacent rotor magnets being different from the gaps between adjacent stator pole faces within a stator group. Gaps between magnets provide a longer flux path in the rotor back iron. As the gaps are uniform, the overall flux distribution in the back iron along the circumferential path forms a repeated arch-like pattern. This pattern effects an improved uniform distribution of magnetic potential difference of the magnet surfaces at the air gap.

Reference is made to the specification for a more detailed description of the present invention. Claim 1, the sole independent claim on appeal, is presented below with elements read on drawing figures, as urged in MPEP 1206.

1. A rotary electric motor comprising:

a stator (20) configured in the form of an annular ring having a plurality of groups (22) of electromagnet poles, the groups substantially equidistantly distributed along the angular extent of the annular ring, each of the groups comprising magnetic material (24) magnetically isolated and separated from the other groups, the electromagnet poles having pole faces (26) separated from each other by gaps, gaps between pole faces within each group being of a substantially uniform first angular distance; and

an annular rotor (10), concentric with an axis of rotation and concentric with the annular stator to form a radial air gap therebetween, comprising a plurality of permanent magnets (12) substantially equidistantly distributed with alternating magnetic polarity along the angular extent of the air gap and separated from each other

by gaps of a second angular distance different from the first angular distance, the permanent magnets having a common magnetic return path (14);

wherein each group of electromagnet poles comprises windings (28) that are switchably energized for driving electromotive interaction between the stator and rotor.

As stated in the section of the Manual noted above, the claims are not to be limited to this embodiment by such reading.

VI. Issues

1. Whether claims 1, 3, 5, 6 and 11 are unpatentable over U.S. patent 4,754,207 (hereinafter "Heidelberg") in view of U.S. patent 6,181,035 (hereinafter "Acquaviva") under 35 U.S.C. § 103(a).
2. Whether claim 4 is unpatentable over Heidelberg, in view of Acquaviva and U.S. patent 6,278,216 (hereinafter "Li") under 35 U.S.C. § 103(a).
3. Whether claims 2 and 12 are unpatentable over Heidelberg, in view of Acquaviva and U.S. patent 5,015,903 (hereinafter "Hancock") under 35 U.S.C. § 103(a).
4. Whether claims 13 through 15 are unpatentable over Heidelberg, in view of Acquaviva and U.S. patent 5,918,360 (hereinafter "Forbes") under 35 U.S.C. § 103(a).
5. Whether claim 16 is unpatentable over Heidelberg, in view of Acquaviva, Forbes and Li under 35 U.S.C. § 103(a).

VII. Grouping Of Claims

The Office Action has applied five rejections, corresponding to the issues set forth above, each rejection relying on a different combination of references. For each rejection,

the Office Action has treated each of the claims individually. In the argument that follows, claims 1, 3, 5 and 11 may be considered to stand or fall together, claims 2 and 12 may be considered to stand or fall together, and patentability of each of the remaining claims on appeal is urged for the respective express recitation of the claims as well as for features required by virtue of parent claim limitations.

VIII. Argument

All rejections have been imposed under 35 U.S.C. § 103(a). Appellant submits that the record does not establish obviousness for any of the claims on appeal when considered within the framework of well developed legal precedent, briefly summarized below.

Obviousness under 35 U.S.C. §103 must be determined by considering (1) the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims in issue; and (3) resolving the level of ordinary skill in the pertinent art, *Graham v. John Deere Co.* 383 U.S. 1, 13, 148 USPQ 459, 465 (1966). In making this determination, the PTO is charged with the initial burden of identifying a source in the applied prior art for: (1) claim features; and (2) the realistic requisite motivation for combining applied references to arrive at the claimed invention with a reasonable expectation of successfully achieving a specific benefit. *Smith Industries Medical Systems v. Vital Signs*, 183 F.3d 1347, 51 USPQ2d 1415 (Fed. Cir. 1999). Even if the prior art *could* have been modified so as to result in the combination defined by the claims, the modification would not have been obvious unless the prior art suggested the desirability of the modification. *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986). In the absence of such a prior art suggestion for modification of the references, the basis of the

rejection is no more than inappropriate hindsight reconstruction using appellant's claims as a guide. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967). A compelling reason why one having ordinary skill in the art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention must be formulated.

Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967).

Rejections under 35 U.S.C. §103 must be predicated upon facts, not assumptions. *In re Freed*, 425 F.2d 785, 165 USPQ 570 (CCPA 1970); *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967); *In re Lunsford*, 357 F.2d 385, 148 USPQ 721 (CCPA 1966).

What may or may not be known in general does not establish the requisite realistic motivation to support the ultimate legal conclusion of obviousness under 35 U.S.C. §103. *In re Deuel*, 51 F.3d 1552, 34 USPQ2d 1210 (Fed. Cir. 1995). The requisite motivation is not an abstract concept, but must stem from the applied prior art as a whole and have realistically impelled one having ordinary skill in the art, at the time the invention was made, to modify a reference in a specific manner to arrive at a specifically claimed invention with a reasonable expectation of achieving a specific benefit. *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989). In consideration of the prior art as a whole, it is impermissible to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. *In re Wesslau*, 353 F.2d 241, 147 USPQ 393. The totality of the prior art disclosures must not lead

substantially away from the claimed invention. *In re Hedges*, 753 F.2d 781, 228 USPQ2d 685 (Fed. Cir. 1986). Emphasis in a reference of the importance of a feature is a significant factor in determining whether or not it would have been obvious to change the disclosed feature. *In re Bell*, 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993).

A. The rejection of claims 1, 3, 5, 6 and 11 as being unpatentable over Heidelberg in view Acquaviva under 35 U.S.C. § 103(a)

1. Claims 1, 3, 5 and 11.

Claim 1 is independent, claims 3, 5 and 11 depending therefrom. Claim 1 recites, *inter alia*, the following:

... the (stator) electromagnet poles having pole faces separated from each other by gaps, gaps between pole faces within each group being of a substantially uniform first angular distance; and ... a plurality of (rotor) permanent magnets substantially equidistantly distributed with alternating magnetic polarity along the angular extent of the air gap and separated from each other by gaps of a second angular distance different from the first angular distance

The Office Action (page 3) recognizes that the primary prior art reference, Heidelberg, does not disclose that the permanent magnets of the rotor are separated from each other by gaps that are of a different dimension from the gaps between the poles of a stator group. In fact, in the embodiment of Fig. 1, which has been relied upon for the other claimed features, there are no gaps between adjacent permanent magnets. Acquaviva has been relied upon for disclosing a permanent magnet motor having rotor permanent magnets separated from each other by a dimension different from the slot dimensions of the stator. According to the Office Action, "[s]ince Heidelberg et al. and Accquaviva [*sic*] are in the same field of endeavor, . . . [i]t would have been obvious . . . to modify Heidelberg et al.

by reducing the angular length of the permanent magnets (8) to create gaps of a second angular distance different from the first angular distance . . . for the purpose of reducing cogging torque." The Examiner thus proposes to modify the structure of Fig. 1 of Heidelberg, not only to create gaps between rotor magnets where there were none, but to dimension the gaps to be different from the dimension of the separation between stator poles of a group.

It is submitted that the reference teachings taken as a whole would not have suggested the proposed modification. The rotor and stator structures of the two references, *e.g.* the geometric configuration and size relationships between the rotor and stator elements, are significantly different in each reference and are particularly established in each reference to serve a different objective. It is submitted that a person of ordinary skill in the art, simply because the two references are categorized as "being in the same [undefined] field of endeavor," would not have been led to modify Heidelberg in order to obtain therein reduced cogging torque benefits achieved in the Acquaviva configuration.

Heidelberg discloses a motor having salient stator poles that interact with the permanent magnets of the rotor. Several structural embodiments are disclosed for overcoming problems (column 1, line 48+) that are a consequence of simultaneous switching of electromagnets, such as irregular motor operation, pulsating mains loading, and motor starting difficulties. Heidelberg is directed to providing a "reduction of disturbing reactions between adjacent electromagnets (column 2, lines 18-19)."

Heidelberg uses the term "electromagnet" to signify each stator pole upon which a winding is formed. As described at column 2, lines 26+,:

[A]djacent electromagnets belonging to a common group of electromagnets are switched as belonging to one phase very close together in time,

preferably simultaneously, and the electromagnets belonging to adjacent groups of electromagnets are switched as belonging to different phases at different times. . . . those points of the electromagnets to be switched at different times are adjacent, being reduced in number because they are only present at the boundaries or transition points between the groups of electromagnets.

Heidelberg's objectives are thus to provide as many "electromagnets" within the same group so that fewer groups are utilized, thereby fewer points at which adjacent electromagnets are switched at different times. As a further enhancement, the embodiment of Fig. 1 provides a greater separation between adjacent electromagnets of different groups to ameliorate the disturbance. Other embodiments address the problem by providing different shapes of poles at particular positions within groups, provision or deletion of windings for poles at specific positions within groups, with the additional provision (embodiment of Fig. 3) of stator permanent magnets grouped so that distances between adjacent permanent magnets of adjoining groups are different from distances between adjacent magnets of a common group (the electromagnets formed on the rotor in this disclosed embodiment). Each embodiment is structured for the particular magnet gap, or non-gap, dimensions that are appropriate for the particular stator pole configurations and spacings of the respective embodiment.

The Acquaviva motor (Fig. 3) comprises a non-salient pole stator having slots at the air gap that contain winding coils. The slots are equally spaced about the air gap periphery at a center-to-center distance of p . Permanent magnets 40 distributed about the air gap are evenly spaced and separated from each other by the distance S . The circumferential extent of each permanent magnet is significantly greater than slot dimension p . The number of slots is at least twice the number of rotor magnets, as precisely defined at column 2, line 30. The magnet spacing S , defined as $(kp-3w)$, is

greater than the stator distance between slots (significantly larger than the dimension of a comparable stator pole at the air gap). The corners of the rotor magnets are bevelled at about a 45 degree angle to a depth of about one and one-half times the radial width of the air gap. These precise relationships are adhered to so that:

the distribution of the density of magnetic energy that is stored in the air gap in the absence of stator slots, as a function of a linear coordinate taken along a circumference disposed within the air gap and coaxial to the motor axis, exhibits an increasing transition in magnitude in a first angular position near a first end of a magnetic polarity and a decreasing transition in magnitude in a second angular position near a second end of the magnetic polarity, the transitions being asymmetrical with respect to each other and the density of magnet energy being substantially constant between consecutive transitions. . . . [W]hen a first slot is in a first angular position corresponding to the first angular position of the increasing transition in magnitude of the distribution of magnetic energy density, a second slot is in a second angular position that corresponds to the second angular position of the decreasing transition in magnitude of the distribution of magnetic energy density, each slot functioning to modify the distribution of the density of magnetic energy in the air gap according to a modulation function which has a local development symmetrical to a radial plane passing through the center of the slot (the paragraph bridging columns 1 and 2).

It is submitted that a person of ordinary skill in the art, upon consideration of the above quoted passage and the remainder of the patent disclosure, would have concluded that the geometric configuration of the rotor magnets and the spacing therebetween is critically dependent upon the precise stator configuration disclosed. The Office Action, it is submitted, does not establish why the artisan would have considered from the teachings of the Acquaviva disclosure, let alone have been motivated, to simply "reduc[e] the angular length of the permanent magnets [of Heidelberg] to create gaps" to meet the claim requirements, as posited in the Office Action. It is urged, therefore, that the burden of establishing obviousness under 35 U.S.C. § 103 has not been met.

It is appellant's further position that consideration of the prior art as a whole would

have led the artisan away from the modification proposed in the Office Action. The artisan would not have chosen to rely upon the Acquaviva magnet spacing teaching to the exclusion of the particular stator structure to which the teaching is related because Acquaviva emphasizes the importance of the disclosed relationship between rotor and stator elements. Thus, if modification of the Heidelberg rotor magnets were to be made, the artisan would have been impelled by the Acquaviva teachings to modify the stator structure of Heidelberg to preserve the advantages taught by Acquaviva. The record provides no evidence that the Examiner has considered such additional modification nor reasonably concluded that such a modification would preserve the objectives and advantages espoused by the Heidelberg disclosure attributed to the particular configurations shown therein. Rather, it is submitted that the prior art as a whole teaches away from the modification proposed in the Office Action.

2. Claim 6.

Claim 6 is dependent from claim 1 and thus contains the above noted requirements of claim 1. It is submitted that criteria for rejection of claim 6 under 35 U.S.C. § 103 have not been satisfied, for the same reasons set forth above with respect to its parent claim. Claim 6 additionally requires that the angular distance of the gaps between adjacent poles of adjacent stator groups is different from the angular distance of the gaps between adjacent permanent magnets of the rotor. This, not only must the rotor magnet gap dimension be different from the spacing between adjacent poles within a stator group, but must also be different from the spacing between adjacent poles of different groups. The Office Action at page 4, refers to Fig. 3 of Heidelberg for disclosing gaps between

magnets. This embodiment, however, contains a different stator configuration, which lacks stator requirements of the claim. If the Examiner's intent is to modify the configuration of Heidelberg's Fig. 1 by providing rotor spacing as shown in Fig. 3 of Heidelberg, no portion of the disclosure has been identified to support such teaching. Appellant's reading of Heidelberg points to the conclusion that each of the embodiments disclosed requires the particular configuration shown for the respective embodiments and that there is no invitation to mix and match different pieces of one embodiment for another.

B. The rejection of claim 4 as being unpatentable over Heidelberg, in view of Acquaviva and Li under 35 U.S.C. § 103(a).

Claim 4 is dependent from claim 3 and further requires a resolver and an encoder for generating said signals. Li is relied upon solely for teaching of a resolver and encoder used in an electric motor. Li does not teach the rotor stator and structure relationships required by independent claim 1.

Claim 4 is also dependent ultimately from claim 1. It is submitted that criteria for rejection of claim 4 under 35 U.S.C. § 103 have not been satisfied with the additional consideration of Li, for the same reasons set forth above with respect to parent claim 1. With respect to the requirement for resolver and encoder, it is submitted that the Office Action has not established why a person of ordinary skill in the art would have substituted the claimed arrangement for the disclosed Hall sensors of Heidelberg. Heidelberg discloses the need to specifically locate a Hall sensor at one or more of the locations between adjacent stator groups. A change in magnetic polarity is sensed only at the locations of the Hall sensor(s). Stator winding energization is changed in response to the

sensed change in polarity. A resolver, on the other hand, provides a continuous output representing rotor position. The Office Action points out that Li is evidence that resolvers are known devices for detecting rotor position but does not why resolver rotor position detection would have been considered by the artisan to provide the magnetic polarity change detection performed by the Hall sensors of Heidelberg, let alone put forth a compelling reason for replacing the Hall with a resolver and encoder.

C. The rejection of claims 2 and 12 as being unpatentable over Heidelberg, in view of Acquaviva and Hancock under 35 U.S.C. § 103(a).

Claims 2 and 12 are each dependent from claim 1. Claim 2 further requires that stator group comprises no more than a single pair of poles, each pole having a winding configured when energized to form a magnetic polarity opposite to the magnetic polarity of the other pole of the pair. Claim 12 recites that the number of stator groups is an odd number and the number of poles within each stator group is an even number.

It is submitted that criteria for rejection of claims 2 and 12 under 35 U.S.C. § 103, as well as for all dependent claims that require the limitations of parent claim 1, have not been satisfied with the additional consideration of Hancock, for the same reasons set forth above with respect to parent claim 1.

The Office Action states that the modification of the Heidelberg structure proposed for meeting the requirements of claim 1 would not contain stator pole groups that are each limited to two poles. Thus, the Examiner looks to Hancock to support a further modification. The Office Action states that it would have been obvious, in view of illustrations of Figs. 9a and 9b of Hancock, to form stator groups of a single pair of poles

in the previously proposed modification of Heidelberg, "for the purpose of preventing flux reversal and high switching frequencies in motor."

It is submitted that the rationale for obviousness stated in the Office Action falls short of the requisite burden under 35 U.S.C. § 103. The Hancock disclosure is directed to a reluctance motor, not a permanent magnet motor. Columns 1 and 2 provides considerable background discussion of similarities and differences between reluctance motors and permanent magnet motors. Lacking permanent magnets, "reluctance motors are designed for efficient power conversion rather than for particular torque or control characteristics typically required in stepper motor applications, and the pole geometry and control strategies differ accordingly (column 1, line 20+)." Hancock is concerned with overcoming a problem that occurs in reluctance motors in which unwanted secondary magnetic circuits are created that interact with the flux path of primary magnetic circuits, thereby effectively increasing the flux switching frequency in the portions of the stator at which the primary and secondary magnetic circuits overlap, column 2, line 25+.

It does not appear from the Hancock disclosure, that this phenomenon is a significant problem with permanent magnet motors, nor does the Office Action establish that it is. It is submitted, therefore, that a person of ordinary skill in the art would have had no reason to apply the teachings of Hancock to Heidelberg and Acquaviva, either individually or in combination.

Moreover, the modification proposed in the Office Action is in contradiction to the teachings of both Heidelberg and Acquaviva. Heidelberg seeks to reduce the number of points at which adjacent electromagnets are switched at different times. These points are only present at the boundaries between groups. To minimize the number of groups,

Heidelberg provides a large number of "electromagnets" within the same group. The Examiner's proposal to modify the Heidelberg arrangement by limiting the number of stator poles in each group to two is antithetic to the Heidelberg teachings. With respect to Acquaviva, the motor is not a salient pole motor and does not have stator groups that would have been considered by the artisan to comprise separate electromagnets. The proposed modification would have rendered the teachings of Acquaviva useless.

D. The rejection of claims 13 through 15 as being unpatentable over Heidelberg, in view of Acquaviva and Forbes under 35 U.S.C. § 103(a).

Claims 13 through 15 depend, either directly or indirectly, from independent claim 1. It is submitted that criteria for rejection of claims 13 through 15 under 35 U.S.C. § 103, as well as for all dependent claims that require the limitations of parent claim 1, have not been satisfied with the additional consideration of Forbes, for the same reasons set forth above with respect to parent claim 1.

Claim 13 additionally requires that each stator group is individually secured to a non-magnetically permeable support structure, thereby facilitating independent removal and replacement of an individual stator group and a switched energization circuit component associated therewith. Page 7 of the Office Action cites Fig. 24 and column 17, lines 40-45 of Forbes for teaching this subject matter. Appellant finds no contemplation therein of facilitating independent removal and replacement of a stator group. The Office Action does not state specifically how the previous modification of Heidelberg is to be further modified. It is submitted that the structures of Heidelberg and Forbes are significantly different such that the Examiner's proposed modification is based on

impermissible hindsight reconstruction.

Claim 14 additionally requires that the support structure comprise a plate member and a shaft member located at the axis of rotation, wherein each of said stator groups is secured to said plate member at a spaced radial distance from the axis of rotation; and said plate member is attached to said shaft member. The Office Action again relies on Fig. 24 of Forbes, stating that plate member 281 has secured thereto each of the stator cores. However, the plate member 281 has attached thereto a hybrid power package 283 of solid state components (column 17, lines 42+). The plate member is not a support structure for the stator components, but is a heat sink upon which solid stated components are mounted. It is submitted that the Office Action has not established that Forbes discloses this claimed subject matter, let alone present a rationale as to obviousness as required under 35 U.S.C. § 103.

Claim 15 is dependent from claim 14 and further requires that the spaced distance (from axis to where the stator groups are secured) is greater than the radial distance between inner and outer boundary diameters of the stator annular ring. The Office Action states that Heidelberg discloses this requirement. Appellant respectfully disagrees. Fig. 1 is the only figure of Heidelberg that illustrates the motor in the radial direction. It is not evident to appellant that the innermost boundary of the stator is closer to the axis of rotation than to the outermost boundary of the stator. The precise distances are a matter of speculation. The figure cannot be relied upon for disclosing exact dimensions of the elements in the absence of specific description thereof in the specification. As the Heidelberg disclosure is not specific to this issue, it is submitted that it cannot be fairly concluded that Heidelberg meets this claim requirement.

E. The rejection of claim 16 as being unpatentable over Heidelberg, in view of Acquaviva, Forbes and Li under 35 U.S.C. § 103(a).

Claim 16 is dependent from claim 13 (ultimately dependent from claim 1) and further requires a rotor housing, the rotor annular rotor being mounted within the housing at a spaced radial distance from the axis of rotation, and the rotor housing is journaled for rotation about the shaft through bearings. The Office Action relies on Li's disclosure of an annular rotor mounted within a housing that is journaled for rotation about a shaft through bearings. The Office Action concludes that, since all the applied references "are in the same field of endeavor," it would have been obvious to further modify the previous proposed modification to include the stated Li arrangement.

It is submitted that criteria for rejection of claim 16 under 35 U.S.C. § 103 have not been satisfied with the additional consideration of Li, for the same reasons set forth above with respect to parent claim 1. In addition, it is submitted that the rejection fails with respect to the additional requirements of claim 16. The recitation added by claim 16 is a subcombination of the entire claim combination required by claim 16 and all its parent claims. The Office Action relies on Li for concluding that the subcombination, *per se*, is well known. The Office Action, however, fails to explain why an artisan would have modified the other prior art devices to replace the subcombination taught therein with the that of Li.

In the invention of claim 16, among all other requirements, the shaft is at the axis and is stationary, having the stator mounted thereon. The rotor and its housing rotates about the shaft. Both Heidelberg and Forbes disclose arrangements wherein the rotor is

mounted directly to the shaft, the structure being rotatable. The shaft in these references is journalled to the stator through bearings. It is submitted that the rejection fails in this respect because it simply proposes to substitute one element (or subcombination) for another without considering the invention as a whole. Although the Li arrangement was well known, the artisan would not have been motivated to modify Heidelberg or Forbes, either individually or in combination, because such modification would have entailed a significant reconstruction of those reference structures without affording any disclosed benefits.

IX. CONCLUSION

The record does not establish that the PTO has discharged its burden to deny patentability to claims 1 through 6 and 11 through 16 under 35 U.S.C. §103. It is respectfully submitted that the rejections of claims 1, 3, 5, 6 and 11 as being unpatentable over Heidelberg, in view of Acquaviva, of claim 4 as being unpatentable over Heidelberg, in view of Acquaviva and Li, of claims 2 and 12 as being unpatentable over Heidelberg, in view of Acquaviva and Hancock, of claims 12 through 15 as being unpatentable over Heidelberg, in view of Acquaviva and Forbes, of claim 16 as being unpatentable over Heidelberg, in view of Acquaviva, Forbes and Li,, all under 35 U.S.C. § 103(a), are not viable. Reversal of all rejections is respectfully solicited.

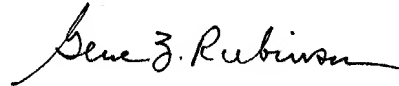
To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

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paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPENDIX

1. A rotary electric motor comprising:

a stator configured in the form of an annular ring having a plurality of groups of electromagnet poles, the groups substantially equidistantly distributed along the angular extent of the annular ring, each of the groups comprising magnetic material magnetically isolated and separated from the other groups, the electromagnet poles having pole faces separated from each other by gaps, gaps between pole faces within each group being of a substantially uniform first angular distance; and

an annular rotor, concentric with an axis of rotation and concentric with the annular stator to form a radial air gap therebetween, comprising a plurality of permanent magnets substantially equidistantly distributed with alternating magnetic polarity along the angular extent of the air gap and separated from each other by gaps of a second angular distance different from the first angular distance, the permanent magnets having a common magnetic return path;

wherein each group of electromagnet poles comprises windings that are switchably energized for driving electromotive interaction between the stator and rotor.

2. A rotary electric motor as recited in claim 1, wherein each stator group comprises no more than a single pair of poles, each pole having a winding configured to form a magnetic polarity opposite to the magnetic polarity of the other pole of the pair, wherein switched energization of the pole pair winding effects reversal of the magnetic polarities of the pole pair.

3. A rotary electric motor as recited in claim 1, further comprising a rotor position sensor, wherein signals for switching energization of the windings are generated in response to the sensor.

4. A rotary electric motor as recited in claim 3, wherein said position sensor comprises a resolver;
and said motor further comprises an encoder for generating said signals.
5. A rotary electric motor as recited in claim 1, wherein the angular distance of the gaps between adjacent pole faces of each stator group differs from the angular distance of the gaps between adjacent stator pole faces of adjacent groups.
6. A rotary electric motor as recited in claim 5, wherein the angular distance of the gaps between adjacent poles of adjacent stator groups is different from the angular distance of the gaps between adjacent permanent magnets of the rotor.
11. A rotary electric motor as recited in claim 1, wherein the rotor surrounds the stator.
12. A rotary electric motor as recited in claim 1, wherein the number of stator groups is an odd number and the number of poles within each stator group is an even number.
13. A rotary electric motor as recited in claim 1, wherein each stator group is individually secured to a non-magnetically permeable support structure, thereby facilitating independent removal and replacement of an individual stator group and a switched energization circuit component associated therewith.

14. A rotary electric motor as recited in claim 13, wherein said support structure comprises:
a plate member; and
a shaft member located at the axis of rotation;
wherein each of said stator groups is secured to said plate member at a spaced radial distance
from the axis of rotation; and
said plate member is attached to said shaft member.
15. A rotary electric motor as recited in claim 14, wherein said spaced radial distance is greater
than the radial distance between inner and outer boundary diameters of the stator annular ring.
16. A rotary electric motor as recited in claim 13, wherein said motor further comprises a rotor
housing, the rotor annular rotor being mounted within the housing at a spaced radial distance from the
axis of rotation, and the rotor housing is journalled for rotation about the shaft through bearings, and
the rotor comprises said first annular ring member.